

Introduction:

The purpose of this invitro study is to evaluate the antibacterial property and shear bond strength of the modified orthodontic composite incorporated with nanoparticles of Titanium dioxide (TiO₂) and Zinc Oxide (ZnO) at two different concentrations and this study also compares which nanoparticle has better antibacterial property without compromising the shear bond strength.

Materials and Methods:

ZnO nanoparticles and TiO₂ nanoparticles in dispersion form were added to commercially available orthodontic adhesive Transbond-XT at 1% and 5% concentration separately by a speed mixer to form modified composite. In this study 50 human extracted teeth were used which are divided into five groups of 10 tooth each and were bonded with brackets using different group bonding adhesives Transbond-XT , Tran- XT 1% ZnO-NPs, Tran XT 5% ZnO-NPs, Tran- XT 1% TiO₂-NPs and Tran-XT 5% TiO₂-NPs respectively. Shear bond testing was done using Universal testing machine.30 disc specimens were prepared using different group bonding adhesive and one disc from each group were subjected to SEM-EDAX analysis and the remaining were used for antibacterial analysis against *Streptococcus mutans* using Bauer-Kirby disc diffusion assay.

Result:

Analysis of variance indicated a significant difference ($P < 0.005$) among the groups. The mean shear bond strength of Transbond-XT (Group-I) control was found to be 16.91 ± 1.35 MPa It was slightly decreased to 16.13 ± 1.42 MPa in Group-II (Tran-XT 1%ZnO- NPs) and further decreased to 11.92 ± 1.56 MPa in Group-III

(Tran-XT 5% ZnO-NPs). The mean shear bond strength was increased in Group-IV (Tran-XT 1% TiO₂-NPs) to 17.54 ± 1.74 MPa than the control but it shows a decrease in Group-V (Tran-XT 5 %TiO₂- NPs) to 14.35 ± 1.78 MPa. All groups except control showed antibacterial effect. The biggest zone of inhibition was seen in Group-III (Tran-XT 5 % ZnO- NPs) 18.08 ± 0.14 mm. Smallest zone of inhibition is seen in Group-IV (Tran-XT 1% TiO₂-NPs) 5.94 ± 0.15 mm. The antimicrobial effect is present in the modified adhesive even after one month.

Conclusion:

The result showed that ZnO nanoparticles and TiO₂ nanoparticles incorporated modified orthodontic adhesive showed added microbial property to the original compound without adversely affecting the Shear bond strength. ZnO nanoparticles showed the greatest antimicrobial activity. Antimicrobial property was seen even after 1 month.

Key Words:

White spot lesion, Shear bond strength, Antimicrobial activity, Nanoparticles, Orthodontic adhesive